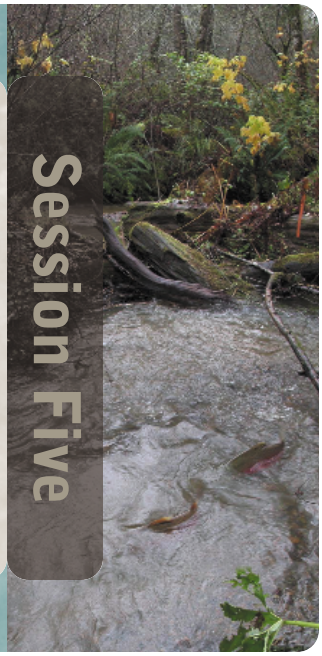

Upgrading and installation of fish passages and fish screens, offstream water storage

# Making a Good Run... A Watershed Approach to Restoration of Clear Creek

**HARRY RECTENWALD**
California Department of Fish and Game
601 Locust Street
Redding, CA 96001
hrectenw@dfg.ca.gov

## ABSTRACT

Successful salmon and steelhead restoration efforts depend on developing a community based watershed approach to planning habitat restoration projects that focuses on implementing the most biologically effective projects. Once fishery problems are identified and understood by all the interested and involved parties in the community, the success of the program depends on removing limiting factors to the populations of anadromous fish. One problem that is well understood is restoring access to cold water habitat on anadromous streams. On lower Clear Creek, a tributary to the upper Sacramento River, there has been decades of restoration planning effort for the watershed. Remedy of fish passage at Saeltzer Dam, located 6 miles from the mouth of the stream, has been a priority project over several years. Several modifications to the fish ladder at the dam were unsuccessful. This paper presents the ultimate remedy for this problem which resulted in the removal of the dam facilitated by exchanging the owner's water rights to another service area. Of special concern are the planning processes and methods of reaching public and agency consensus on the different restoration options that achieve the objectives. Identifying the long-term costs associated with the restoration planning efforts is difficult at best. Identifying construction and project management costs to implement the project are simpler; however, many of the necessary development costs such as legal agreements and activities to achieve community acceptance are difficult to quantify.

## INTRODUCTION

Restoration of salmon is often facilitated through a community based planning process that takes a watershed approach and prioritizes actions that have biological effectiveness. Identification and acceptance of problems and solutions is a long-term process that involves experts, community members and owners of the water and land resources involved in proposed actions. Consensus between all of the involved parties can determine if a project can move forward.

Through several different restoration planning efforts taking place in lower Clear Creek over a number of years, fishery agencies identified six habitat factors that limit production of salmon and steelhead. The two key limiting factors to habitat were flow reductions below dams and fish passage problems at Saeltzer Dam. Streamflow in lower Clear Creek is reduced first by Whiskeytown Dam which diverts approximately 87 percent of the natural flow out of the lower Clear Creek basin, then by Saeltzer Dam which has a right to divert a large portion of the releases from Whiskeytown Dam. Experimental actions to increase the streamflow below the two dams were first accomplished in 1992 and 1993. As a result it appeared that the juvenile fish produced due to these increased flows returned three years later as adults in numbers significantly larger than in the past (two to three times past averages), indicating high biological effectiveness for this action.

The lack of adequate fish passage at Saeltzer Dam blocked fish from 10 miles of cold water habitat located downstream of Whiskeytown Dam. The Saeltzer Dam Fish Passage and Flow Preservation Project implemented in 2000 is presented to illustrate a process of planning, developing, funding, permitting and constructing a project, complete with early public involvement and environmental analysis.

### Keeping Track of Costs

Over a twenty year period, various salmon and steelhead restoration efforts were started by different institutions with each producing a different document. All the documents identified a need for fish passage improvement at Saeltzer Dam. Because long-term planning occurs on a watershed basis and supports sets of actions throughout the watershed, there is no cost accounting effort for individual actions. Costs for earlier efforts were essentially absorbed by the fishery and water management agencies.

In the last decade there was a focus on community based restoration planning that involved conferencing with interested and involved parties to achieve common understandings on biological problems and potential solutions. A broad multi-agency restoration planning process for salmon, steelhead, and riparian habitat in the upper Sacramento River watershed was completed by the State of California fourteen years ago. The major elements of this consensus based plan for the river basin included Clear Creek. In 1992 Federal legislation was passed that focused on funding the major actions described in the State's Upper Sacramento River Basin Restoration Plan. This legislation focused on restoring fish and wildlife in the portions of the Sacramento River affected by the Central Valley Project operated by the U.S. Bureau of Reclamation (USBR), including lower Clear Creek where flows are controlled by Whiskeytown Dam as a part of the Central Valley Project. The specific actions included improving streamflow from Whiskeytown Dam, providing fish with passage at Saeltzer Dam (located 10 miles downstream) and channel restoration. The Federal legislation provided a funding source. Costs to administer the program were spread out over the entire Central Valley.

## PROJECT PLANNING

Planning for the Saeltzer Dam project included participation of interested and involved parties in the following ways:

• An *open planning process* was used over a period of several years to develop a list of potential solutions. The Coordinated Resource Management Process (CRMP) was the main process used by the group facilitat-

ing the effort, the Western Shasta Resource Conservation District (WSRCD).

• *Motivation of the owner of the dam and water* to solve environmental problems occurred with increased awareness coupled with conservation interests, access to outside funding sources and confidence in the engineering feasibility.

• *Local community acceptance* came with increased awareness of the acute nature of the biological problems and the ability of the project to accomplish restoration with willingness of the private owners. The CRMP process and the environmental decision-making process facilitated most of the public discussion.

• *Consensus among government agencies* occurred as coordination and resolution of different policies took place among all the Federal, State and local agencies. The CRMP process and interagency conferencing facilitated most of this discussion.

• *Environmental advocate group acceptance* came with awareness that the agreements made with the dam owner would protect the public trust resources. The agreements were included in the environmental documents circulated for public review.

The detailed planning process began with the formation of a technical team consisting of representatives from the primary agencies and organizations interested in restoration of Clear Creek (Table 1). The team evolved into the Coordinated Resource Management Group facilitated by the WSRCD. Different members of the team solicited the involvement of interested parties in the community, the upper Sacramento River basin, potential funding agencies as well as the owners of the water resources and the dam. To advance the project at Saeltzer Dam, the California Department of Fish and Game (CDFG) and Department of Water Resources worked together to complete engineering and geology studies appraising ten potential solutions for feasibility and cost. From the list of optional solutions, three were selected by the involved parties and the owner

**Table 1. Agencies involved in the technical team initially developed for lower Clear Creek restoration**

- U.S. Bureau of Reclamation
- Cal Fed Ecosystem Restoration Program
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- Natural Resource Conservation Service
- National Park Service
- California Department of Water Resources
- California Department of Fish and Game
- California Regional Water Quality Control Board
- Western Shasta County Resource Conservation District
- Shasta County Environmental School
- Clear Creek Coordinated Resource Management Group

**Table 2. Three optional solutions for solving fish passage problems at Saeltzer Dam on lower Clear Creek selected for detailed studies**

- Rehabilitate existing dam and install fish screen and ladder.
- Remove existing dam and construct new low dam with fish ladder and screen at biologically superior upstream location.
- Remove dam and transfer water rights to diversion points outside of watershed while preserving stream flow in the creek as controlled by Whiskeytown Dam.

**Table 3. Comparison of three optional solutions to the fish passage problem at Saeltzer Dam located on lower Clear Creek**

| Parameter | Rehabilitate and modernize dam | Remove and reconstruct dam | Remove dam, move water right and preserve flow |
|---|---|---|---|
| Estimated cost | $ 3.7 million | $ 4.6 million | $ 5.0 million plus 900 acre feet of environmental water |
| Long-term biological effectiveness | **Poor** Previous fish ladder and screen efforts failed due to site. Structurally the dam is in poor condition. | **Moderate** Risk of operational problems and flood damage. Possibility of stranded investment due to future water right exchange. | **High** Channel returned to original condition. Flow augmented and preserved. |

for more detailed engineering analysis (Table 2).

The detailed analysis is summarized in Table 3 in terms of estimated cost and expected biological effectiveness.

The first option of re-laddering the dam with the lowest cost estimate ($3.7 million), had the least biological effectiveness. Poor performance was expected because three extensive modifications of the ladder could not totally overcome the fish passage delay and blockage. The passage problem was compounded by a steep natural gorge located immediately below the dam that depleted energy reserves of the fish before reaching the dam. Separate attempts to bypass the gorge via an underground tunnel ladder and blasting did not significantly improve passage at the dam. Additionally the dam's advanced age and poor structural condition led to a possibility of dam failure in the future. If a failure was somehow associated with fish ladder construction, it could lead to a damage claim from the dam owner for reconstruction costs.

The second option was to remove and reconstruct the dam and a fish ladder at a better location with a medium cost ($4.6 million), and relatively moderate biological effectiveness. Moderate performance was expected due to a high risk of flood damage to the new facilities. An additional concern was the possibility of a stranded investment in the screen, ladder and dam if in the future the owner pursued a water exchange to service another watershed where they had large land holdings. This possibility promoted discussions on the third option where the water exchange could be conducted before investments were made in the dam.

The third option had the highest cost, but also the highest long-term biological effectiveness and no risk of a stranded investment. The dam would be removed and the water resources exchanged to other areas not serviced by Saeltzer Dam. Water right considerations were a major part of the project. The flow would be preserved by modifying the agreement between the USBR and CDFG for water releases at Whiskeytown Dam. The flow preservation agreement was necessary because if Saeltzer Dam was removed and the water rights were exchanged to other service areas outside of the basin, there was no guarantee of flows to be released from Whiskeytown Dam. Without the agreement supplying water to Saeltzer Dam from Whiskeytown Dam, the creek flow

would be governed by a 1960's agreement with the CDFG that specified summertime releases as low as zero cubic feet per second.

## PROJECT DEVELOPMENT

### Collaboration

#### *Working with Institutions*

Attaining consensus among a large number of institutions having different mandates and policies required coordination. Tracking cost for this activity is difficult at best and varies with each project, depending on complexity. The goal is for each agency to understand the perceptions of the other agencies and how they view the options. For example, the language in the Federal legislation addressing Clear Creek specified construction of a "new ladder" on Saeltzer Dam. To some agencies the legislation meant the options to move or remove the dam could not be considered under that program. Precedence is another common agency concern that needs to be addressed to develop new methods and actions. It was also valuable for the agencies to recognize that no action is a decision resulting in lost time and restoration opportunities for species that do not have much time to recover so they can continue to exist. Sorting out all of the varied and conflicting policies is necessary to enable everyone to work together in earnest.

#### *Working with the Affected Community*

It was considered by all to be infeasible to implement a project without full disclosure to the community and acceptance among the involved parties. The stakeholders must be identified, and then encouraged to communicate their needs and interests to the project proponents. For this to occur effectively it requires some members to overcome trepidations about government sponsored actions in their watershed. Communications were encouraged by sponsoring the development of watershed groups and meeting at convenient times and locations to encourage public participation. Meetings for watershed groups were often in the early evenings at familiar places, such as local schools, or along the creek, to be more convenient to community members. Hopefully, project goals and objectives were developed that were acceptable to the majority of those in the general community. Another helpful aspect of communicating with the community is obtaining some of the history on the occurrence of fish and wildlife in the watershed, which is sometimes more complete than what is in the agency files.

#### *Working with Watershed Groups*

In the Central Valley of California there are numerous watershed groups that are community based. Developing these groups require funding to cover the costs of meeting places, newsletters and the time it takes for citizens to organize and operate the group. The cost to develop the group includes an enormous amount of citizen volunteer time in addition to monetary grants to the groups. The time necessary to develop a working group varies considerably and spans years because the issues are as varied as the personalities in the watershed.

Many restoration actions in the watershed are not directly related to the stream, but are related to the ecosystem and contribute to community acceptance. In a watershed approach, funded actions sometimes help the community as well as the ecosystem. One example is wildfire prevention which protects property in the community and protects the creek from excessive sedimentation. Taking a comprehensive approach to the health of the ecosystem can also help to promote community stewardship of resources in the future. This ensures the long-term effectiveness of restoration projects.

### *Working with Environmental Groups*

There were diverse interests among the environmental groups, including whitewater recreation, stream restoration, dam removal and fishing. As the project progressed, the focus was on the content of agreements between agencies and the dam owner for streamflow preservation, fisheries protection and expenditure of public environmental funds. One of the concerns was that past agreements made by the fishery resource agencies did not provide adequate protection of the public's resources over the long-term. Funding assistance for the project was also successfully solicited from a private source with environmental interests. The content of the agreements was made public in the environmental documentation phase of the project. During development of the agreements, there were many inquiries about the process and content, but there is no way to assign precise costs for the required effort.

### *Working with the Owners of the Water and the Dam*

Three agreements were negotiated with the owner and responsible agencies to select the proposed project for public review. Terms covered exchange of the owner's water rights to another service area, preservation of streamflow in Clear Creek and issues relating to dam removal, canal abandonment and easements. The details included the amount of money from various environmental funding sources, the amount of water in the exchange, the price, the use of environmental water accounts and defining the responsibilities for each party. The final streamflow agreement was complicated because it had to reconcile three previous flow agreements that applied to a ten-mile stretch of creek. A large part of the cost during the negotiation and agreement process was the time that had to be devoted by legal and technical staff from each of the parties to the agreements. This cost was not documented but it was substantial.

### *Working with the Funding Sources*

The funding sources were interested in the construction portion of the project and not the planning. The project manager was responsible for updating the fund providers on cost and schedule. This portion of the project management cost was included in the overall budget for the project. The overall cost of the project was relatively close to the estimated cost.

## Environmental Documentation and Decision Making

Environmental documentation discloses and analyzes the impacts, mitigates impacts, responds to comments and certifies the documents in order to get the necessary permits. The specific process selected under the National Environmental Policy Act was an Environmental Assessment with a Finding of No Significant Impact; the State process under the California Environmental Quality Act used an Initial Study and Mitigated Negative Declaration. This is a moderate level of environmental documentation and process with an abbreviated public review schedule. However, the level of detail and analysis was similar to a fuller level of environmental documentation. The years of scoping prior to the project supported this approach. In addition, the documents made specific commitments to mitigate for each impact in the project description to ensure the public of their full funding and completion. If the process is not done correctly the project can be halted by a disenfranchised party.

Mitigation for the wetland associated with the irrigation canal was a special case. This area was not considered a permanent wetland since the owner had the right to dewater the canal at anytime. Wetlands along the stream, however, are permanent so mitigation was provided by redirecting the water from the canal to the stream where the higher summer flows would permanently

sustain wetlands. One complication of the project was that adjacent property owners no longer received the incidental benefits from leakage after the canal was abandoned. However, because the leakage was not owned or paid for by these adjacent land owners there was no way to use public funds to mitigate for the loss. In addition, the water right holder had a right to include a reasonable portion of the canal leakage in the water exchange that moved the water to a new service area.

### Environmental Findings

Removing the dam provided free passage of salmon and steelhead to 10 miles of cold water habitat between Saeltzer and Whiskeytown dams. This habitat was especially important to spring-run chinook salmon and steelhead in Clear Creek. Both species are scarce in Clear Creek and are listed under the Federal Endangered Species Act as threatened in the Central Valley. By increasing the number of self-sustaining populations of these species in the Central Valley, it increases the probability the species will recover in the Central Valley. The cold water habitat above Saeltzer Dam was estimated to be sufficient to support a population of 3,000 chinook and 5,000 steelhead.

Now that Saeltzer Dam is no longer a barrier, the fish can access the coldest water in lower Clear Creek. When the dam was a barrier it took very large flows to extend the cold water release from Whiskeytown Dam to below Saeltzer Dam. An additional benefit of the project was that such large water releases for temperature control were no longer necessary, allowing this water to be conserved or used for other beneficial purposes.

### Design and Permitting

The construction agency was the USBR. Removal of Saeltzer Dam first required removal of the sediments that were impounded up to the crest of the dam. Due to a history of gold mining in the watershed, the sediments had to be sampled for mercury. Contaminated sediments had to be disposed of in accordance with Clean Water Act permit requirements. Sediment removal and erosion control was needed to prevent sedimentation of salmon spawning habitat below the dam. Permit requirements to monitor, excavate and dispose of the sediments were included in the project design and contracting as well as the cost estimate.

Loss of riparian vegetation in the project area was either avoided or mitigated through replanting. Riparian vegetation along the canal was not disturbed but, as noted previously, it was dewatered and compensated for by increasing flows in the creek. The canal wetlands were not filled and dewatering was within the rights of the owner. The canal was surveyed for species of special concern that had special designations and a contingency fund was established to take appropriate actions if any were found. Ultimately no species of special concern were found along the canal.

Saeltzer Dam was constructed in 1914, making it necessary to conduct a survey for historical values. It was determined that the dam did not have historical value because it was partially reconstructed after a previous dam failure 40 years ago.

The dam was located in a floodway administered by the California Reclamation Board. A simple determination was made that removal of the dam would not increase flooding, due to the negligible size of the reservoir and the fact that it was filled with sediment. Removal of sediments avoided any loss of channel capacity in the creek below the dam.

Access to the construction and disposal areas did not require an easement since the entire reservoir and surrounding uplands were owned by the CDFG. The owner of the dam had an easement with the CDFG that

was transferred back to the Department and added some legal costs.

### Design and Construction

The USBR completed the project on schedule and in substantive compliance with permits. The design and contracting process incorporated all mitigation commitments. Some of the more stringent permit terms required larger costs and innovative design solutions. The cost of handling the mercury included core sampling of the reservoir, dewatering sediments to prevent the release of contaminated water, disposing of sediments and dewatering effluent in appropriate areas. The initial cost estimate was for 25,000 cubic yards of sediment removal but only 13,000 cubic yards needed removal due to the configuration of underlying bedrock.

The design work investigated a concern that there might be a bedrock sill located under sediment in the reservoir that would turn out to be a natural barrier to fish migration. Sediment coring revealed there was no such sill. In addition, historical records indicated salmon migrated a great distance above the site prior to the construction of Saeltzer Dam.

**Table 4. The schedule for implementing the Saeltzer Dam Fish Passage and Flow Preservation Project on Clear Creek during the year 2000**

| | |
|---|---|
| • Agreements | February to June 2000 |
| • Environmental Document | March to July 2000 |
| • Design Process | March to June 2000 |
| • Construction | July to November 2000 |
| • Site Restoration | December 2000 |

### Implementation

The project schedule (Table 4) required that all agreements and environmental documents be certified before the construction season ended at the start of the rainy season.

Initially there was much uncertainty in the agreement process which led to difficulties in determining which project option was going to be implemented. For instance, if removing the dam meant not preserving the flow in the creek, it would be better to modernize the dam to maintain the release water from Whiskeytown Dam to Saeltzer Dam that was conjunctively used by fish. The design process costs were high because it remained flexible since it was simultaneous with agreement processes. In addition, design efforts had a relatively short schedule.

The schedule for the environmental documentation process was supported by biological surveys done over the previous three years in anticipation of the project. Surveys for some biological resources must be done years in advance of construction to be certain of the occurrence and abundance of species of special concern.

Construction was compressed to the last four months of the dry season, making it a challenge to manage such a large contracting and acquisition procedure. The selected contractor had to have a hazardous waste license to handle the contaminants and the contract had to have flexibility to handle unexpected situations.

### Historical Dam Removal Actions in the Region

In Northern California during the early 1900's, numerous small dams were constructed to supply water to mining operations. Many of these dams made sections of stream inaccessible to spawning migrations of salmon and steelhead. By the 1950's a large number of the mines had been abandoned along with the dams; however barriers remained to block fish movement. The CDFG made a concerted effort to contact the owners and advise them the dams would have to be made passable to fish or be

removed pursuant to state law. By the mid-1950's twenty-four dams were surveyed and removed to make a total of 210 miles of good spawning stream accessible to migrations of anadromous fish. The total cost of the operation was estimated at three thousand dollars. Removal actions were typically the explosive shattering of structures to the point they were not a migration barrier. This method could not be successfully employed in modern times.

## SUMMARY

As the overall lower Clear Creek watershed restoration effort evolved over the period of fifteen years, a variable amount of effort was directed at solving the flow and passage problems associated with Saeltzer Dam. Table 5 summarizes the phases in the long-term development of the project. Over the history of the project, many of the elements in implementing the project were undertaken simultaneously. Beginning efforts focused on modifying the fish ladder over the dam, restoring creek sections immediately downstream and monitoring the effectiveness of these modifications. These initial efforts can be characterized as being low intensity and long-term. Once the persistence of the problem was documented and the need to resolve it was legislatively mandated in the CVPIA, efforts intensified within the watershed group and involved parties to implement a permanent remedy. Thus the development cost over time had a long period (10 years) of relatively low effort followed by a shorter period (5 years) of elevated activity, intensifying during the year the project was implemented. Cost tracking is more certain for actual on the ground activities compared to planning and consensus efforts.

For the lower Clear Creek restoration effort the process of setting up a watershed group to develop a community based planning and acceptance process took time and funding. Fortunately, the WSRCD was able to provide a ready made structure for developing a community based watershed group, including a skilled non-profit entity to handle contracts. A key part of the effort was to have citizens step forward and participate to lead the process. The process owes much to the citizen participants who care a great deal about the community, as well as the environment, and spend much of their personal time discussing and resolving a myriad of watershed issues. The watershed approach can build community acceptance by

**Table 5. Basic elements of the Saeltzer Dam Fish Passage and Flow Preservation Project on lower Clear Creek**

1. Problem identification and documentation using a watershed approach
2. Developing and testing alternate solutions for fish passage and flow problems
3. Development of a community-based planning forum
4. Project planning and alternative analysis
5. Negotiating with the owner of the water resources and the dam
6. Seeking community acceptance on selected alternatives
7. Seeking advocate group acceptance on selected alternatives
8. Completing the environmental decision-making process
    - Completing environmental surveys
    - Developing appropriate mitigation
9. Finalizing agreements for land and water resources.
10. Developing designs and cost estimates for selected alternatives
11. Seeking funding sources
12. Completion of permitting, contracting and construction

developing mutually beneficial projects and supporting stewardship.

Implementation depended directly on the cooperation of owners of land and water resources involved in the project. Legal support was needed to make the commitments between the owners and agencies last in the form of binding agreements. Legal support costs varied with the scope of the issues, and each party had technical and legal counsel to review major actions. Four parties and their legal counsel developed three agreements. One agreement included an additional cost for environmental insurance for mercury contamination. The cost depended on the uncertainty and the risk; thus the detailed survey contributed to the insurance analysis.

After construction there were a variety of hidden costs, mostly associated with monitoring and making adjustments to the project. Monitoring activities included erosion control effectiveness, fish passage effectiveness, stream channel adjustments and water quality. The channel changes were not as expected. Some parts of the site were more stable than expected and others less stable. Some adjustments were required because the high flows that were expected to make adjustments did not occur due to dry conditions. Other hidden costs that can be substantial from a biological perspective are delayed restoration actions due to lack of decision-making ability, controversy and/or litigation. Some of the species in the watersheds have such low population levels that they do not have much time left to begin recovery so they can exist in the future.